

Claim Amendments

Amend the claims as follows:

1. (currently amended) A ~~computer readable medium containing computer readable instructions which, when executed by a computer, perform a band model method for determining computing individual atomic and molecular species spectral transmittances through a gaseous medium from atomic and molecular transition data for a given spectral range and atmospheric conditions, the method comprising the steps of:~~

providing atomic and molecular transition data for a given spectral range and atmospheric conditions;

selecting a spectral region to be considered;

dividing ~~at~~the spectral region into a number of spectral bins that determine a spectral resolution, each bin having a width of less than  $1.0\text{ cm}^{-1}$ ;

calculating atomic and molecular species line center absorption from at least an equivalent width of the atomic and molecular transitions centered within each spectral bin;

calculating line tail absorption within each spectral bin from atomic and molecular transitions not centered within the bin; ~~and~~

determining atomic and molecular species spectral transmittances for each spectral bin, the spectral transmittance having a value which is a function of at least the calculated line center absorptions and the calculated line tail absorptions; ~~and~~

using the determined spectral transmittances in analysis of atmospheric optical sensor data.

2. (currently amended) The ~~computer readable medium~~~~method~~ of claim 1, wherein the spectral bins have a width of about  $0.1\text{ cm}^{-1}$ .

3. (currently amended) The ~~computer readable medium~~method of claim 1 wherein the calculating line center absorption step includes calculating, from an exact expansion, a bin Voigt equivalent width of atomic and molecular transitions whose centers lie within the spectral bin.
4. (currently amended) The ~~computer readable medium~~method of claim 3, wherein the exact expansion is an exact modified Bessel functions expansion.
5. (currently amended) The ~~computer readable medium~~method of claim 3, wherein the calculating line tail absorption step includes subtracting line-tail absorption as calculated from a column strength, a Lorentz half-width, a Doppler half-width, and a line tail spectral displacement.
6. (currently amended) The ~~computer readable medium~~method of claim 3, wherein the calculating line center absorption step includes determining a Voigt line-shape function computed at specific frequencies.
7. (currently amended) The ~~computer readable medium~~method of claim 1, wherein the line tail calculation step includes calculating line tail absorption within each bin from atomic and molecular transitions centered outside of the bin using Padé approximant spectral fits to Voigt absorption coefficient curves.
8. (currently amended) The ~~computer readable medium~~method of claim 7, wherein the line tail absorption calculation step includes determining a database of temperature and pressure dependent Padé approximant spectral fits to Voigt absorption coefficient curves.
9. (currently amended) The ~~computer readable medium~~method of claim 8, wherein there are five Padé parameters.
10. (currently amended) The ~~computer readable medium~~method of claim 8, wherein Padé parameters are determined from summed line tail spectral absorption coefficients.

11. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 10, wherein each bin has a center and two edges, and one Padé parameter is determined at the center of the bin, and one at each edge of the bin.

12. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 10, wherein one Padé parameter is the derivative of the absorption coefficient with respect to a normalized spectral variable at the line center.

13. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 10, wherein one Padé parameter is the integral of the spectral absorption coefficient over a spectral band.

14. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 8, wherein the Padé database is generated for a plurality of temperatures.

15. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 8, wherein the Padé database is determined for a plurality of pressures.

16. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 1, wherein the line center absorptions are calculated from atomic and molecular transitions centered no more than half a spectral bin width from the bin, and the line tail absorptions are calculated from atomic and molecular transitions not centered within a half spectral bin from the bin.

17. (currently amended) A ~~computer-readable medium containing computer readable instructions which, when executed by a computer, perform a band model method for computing the contribution of line centers to a determination of individual atomic and molecular species spectral transmittances through a gaseous medium from atomic and molecular transition data for a given spectral range and atmospheric conditions, the method comprising the steps of:~~

~~providing atomic and molecular transition data for a given spectral range and atmospheric conditions;~~

selecting a spectral region to be considered;

dividing ~~at~~ the spectral region into a number of spectral bins that determine a spectral resolution, each bin having a width of less than  $1.0\text{ cm}^{-1}$ ;

calculating a bin Voigt equivalent width of atomic and molecular transitions centered within each spectral bin from an exact expansion; and

determining atomic and molecular species spectral transmittances for each spectral bin, the spectral transmittance having a value which is a function of at least the calculated equivalent widths; and

using the determined spectral transmittances in analysis of atmospheric optical sensor data.

18. (canceled)

19. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 17, wherein the spectral bins have a width of about  $0.1\text{ cm}^{-1}$ .

20. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 17, wherein the exact expansion is an exact modified Bessel functions expansion.

21. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 17, wherein the calculating step includes subtracting line-tail absorption as calculated from a column strength, a Lorentz half-width, a Doppler half-width, and a line tail spectral displacement.

22. (currently amended) The ~~computer-readable medium~~~~method~~ of claim 17, wherein the calculating step includes determining a Voigt line-shape function computed at specific spectral frequencies.

23. (currently amended) A ~~computer-readable medium~~ containing ~~computer-readable instructions which, when executed by a computer, perform a method for computing the~~

contribution of line tails to the determination of individual atomic and molecular species spectral transmittances through a gaseous medium from atomic and molecular transition data for a given spectral range and atmospheric conditions, the method comprising the steps of:

providing atomic and molecular transition data for a given spectral range and atmospheric conditions;

selecting a spectral region to be considered;

dividing ~~at~~the spectral region into a number of spectral bins that determine a spectral resolution, each bin having a width of less than  $1.0\text{ cm}^{-1}$ ;

calculating line tail absorption within each bin from atomic and molecular transitions centered outside of the bin using Padé approximant spectral fits to Voigt absorption coefficient curves; and

determining atomic and molecular species spectral transmittances for each spectral bin, the spectral transmittance having a value which is a function of at least the calculated line tail absorptions; and

using the determined spectral transmittances in analysis of atmospheric optical sensor data.

24. (currently amended) The ~~computer readable medium~~method of claim 23, wherein the calculating step includes determining a database of temperature and pressure dependent Padé approximant spectral fits to Voigt absorption coefficient curves.

25. (currently amended) The ~~computer readable medium~~method of claim 24, wherein there are five Padé parameters.

26. (currently amended) The ~~computer readable medium~~method of claim 24, wherein Padé parameters are determined from summed line tail spectral absorption coefficients.

27. (currently amended) The ~~computer readable medium~~~~method~~ of claim 26, wherein each bin has a center and two edges, and one Padé parameter is determined at the center of the bin, and one at each edge of the bin.
28. (currently amended) The ~~computer readable medium~~~~method~~ of claim 24, wherein one Padé parameter is the derivative of the absorption coefficient with respect to a normalized spectral variable at the line center.
29. (currently amended) The ~~computer readable medium~~~~method~~ of claim 24, wherein one Padé parameter is the integral of the spectral absorption coefficient over a spectral band.
30. (currently amended) The ~~computer readable medium~~~~method~~ of claim 24, wherein the Padé database is generated for a plurality of temperatures.
31. (currently amended) The ~~computer readable medium~~~~method~~ of claim 24, wherein the Padé database is determined for a plurality of pressures.
32. (canceled)
33. (currently amended) The ~~computer readable medium~~~~method~~ of claim 23, wherein the spectral bins have a width of about  $0.1 \text{ cm}^{-1}$ .